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THE SPECIES OF *ARTHROCNEMUM* AND *SALICORNIA* IN SOUTHERN AFRICA.

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INTRODUCTION.

At the time of his death the late Professor C. E. Moss had been engaged for some years on a revision of the *Salicornioideae* of Africa. He had envisaged a study of all the genera, and further had in contemplation a world revision of the genera *Salicornia* and *Arthrocnemum*. However, as his notes on extra-African species are fragmentary and clearly merely preliminary, and as the data available on the African species of the Mediterranean coasts are very far from complete, it has not been found possible to complete more than his treatment of the species of the genera *Arthrocnemum* and *Salicornia* in Southern Africa. It has seemed advisable to complete even this restricted portion as the plants form an exceedingly difficult group of which existing accounts are very far from satisfactory, and Moss himself had carried out detailed studies based largely on living or preserved (not dried) material. In the course of his work Moss had examined the collections in a number of herbaria and had attached MS names to many specimens. Some of these names have been made use of in publications.

The task of working up the notes left by Moss was at first undertaken by Mrs. Moss and myself in co-operation. For a variety of reasons, progress was exceedingly slow. After the death of Mrs. Moss, all the notes and memoranda were handed over to me, and it has at length become possible to produce this paper after an interval of over 20 years. In spite of this inordinate delay it is hoped that it will be of value in the elucidation of plants of a highly critical group and further be something of a memorial to its author who without doubt was among the most able and critical taxonomists in S. Africa.

In its present form the paper is certainly not what its author had originally planned. Its scope has been reduced, but in the more limited field it does express his views on the species concerned and wherever possible in his own words. Some additions and alterations have been made; latin diagnoses have been added for some of the new species; the citation of synonyms has been brought into line with the recommendations of the International Code for Botanical Nomenclature (1952) and keys to the species have been added.

In parts the surviving notes had evidently been made at different times and even expressed conflicting views. Where there was no clear indication as to which was the more recent and mature point of view an editorial decision had to be made. For simplification, in the text such additions and alterations have been incorporated without any special indication.

The citation of specimens has been left as it was set out by the author except for necessary checking and the omission of a few that were marked as doubtful. No attempt has been made to incorporate recent collectings.

R. S. Adamson.

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The original genus *Salicornia* L. has been much divided and nowadays comprises a whole subfamily. The segregation commenced in 1819 when Marschall von Bieberstein separated *Halocnemum*. C. A. Meyer in 1838 separated *Halostachys*, Moquin-Tandon in 1840 *Arthrocnemum* and *Kalidium*, Ungern-Sternberg in 1866 *Halopeplis*, and in 1876 *Heterostachys* and *Micronemum*. S. Watson in 1874 separated the American genus *Spirostachys* (=*Allenrolfea* Kuntze), Bentham and Hooker in 1880 the Australian genera *Pachycornia* and *Tecticornia*, and finally in 1902 Spegazzini separated the S. American *Halophytum*. A small residue of species remains under the original generic name *Salicornia*.

Of these twelve genera, *Halocnemum*, *Halopeplis*, *Arthrocnemum* and *Salicornia* are African and the last three S. African. There is a doubtful record of *Kalidium* for northern Africa (cf. Battandier and Trabut Fl. d'Alg. et Tun. 287. 1902).

Of the African genera *Halopeplis* is easily recognised by the alternate leaves, and *Halocnemum* by the opposite short shoots. The genera *Arthrocnemum* and *Salicornia* are much alike. Both have jointed segmented stems, the joints clothed by the fleshy leaf tissue. The separation of the two has always presented difficulties which it is hoped are now dissolved.

The characters originally ascribed to *Arthrocnemum* by Moquin-Tandon have been adopted by few subsequent botanists, and few have agreed on those which should separate the two genera. Some (e.g. Paulsen Dansk. Bot. Ark. 2·8. 62. 1918. and Chevalier Rev. Bot. App. 12. 52. 1922) have placed under *Arthrocnemum* those species with endospermous seeds and under *Salicornia* those with exendospermous seeds. This view I am unable to endorse because the change from the original conception of *Arthrocnemum* is too great and the determination of this character is very often impracticable. This last is admitted by Paulsen who, when describing new Australian species, confesses that he is not sure to which genus they belong. Finally the endosperm character has not been found to be of generic significance.

Of the two alternatives, placing all the species under *Salicornia*, or redefining the genera, I have adopted the latter. In the generic delimitation the totality of characters of the species is taken into account and the dividing line drawn where the greatest gap occurs. Moquin-Tandon attempted this, as did Bentham and Hooker, but new features have come to light since their day, and these enable the two genera to be defined satisfactorily. I claim that *Arthrocnemum* as here emended, is essentially the original genus but placed on a firm foundation.

Bentham (Fl. Austr. 5. 202. 1870) wrote:— "The species, however, require much further investigation from living plants before the value of the differences in the flowers, which are considerable, can be properly appreciated. A large proportion of the dried specimens before me are not in a state to be satisfactorily examined."

As regards the species dealt with in the present paper, I have collected nearly all of them myself and have made considerable use of fresh material preserved in alcohol or formalin. I have to thank the following correspondents for sending fresh or preserved material:— Professor R. S. Adamson, Miss L. Britten, Professor R. H. Compton, Miss A. V. Duthie, Mrs. M. R. Levyns, and Mr. N. S. Pillans. I have examined all the dried material I could obtain in S. Africa and I wish to thank the authorities of the following herbaria for giving me opportunities for studying specimens in their collections:— Bolus Herb. Cape Town; S. African Museum, Cape Town; Albany Museum Grahamstown; Natal Herb. Durban; National Herb. Pretoria; Transvaal Museum, Pretoria. Private collections have been loaned to me by Mr. H. G. Fourcade, Dr. R. Marloth, Dr. J. Muir, and the Rev. F. A. Rogers.

Especially I thank the authorities of the British Museum (Nat. Hist.) and the Kew Herbarium. For opportunities to study material in the herbaria at Berlin, Cambridge, Copenhagen, Paris, Uppsala and Vienna, I have to thank the Director of the Royal Botanic Gardens, Kew. I have also examined the specimens in the Linnean and Smithian herbaria.

The specimens cited in my own herbarium have almost all been collected by myself and are housed in the Department of Botany, University of the Witwatersrand, Johannesburg. Duplicates of most have been sent to the British Museum and to the other herbaria mentioned.

Dried specimens of succulent plants are notoriously unsatisfactory and glassworts are no exception. If his specimens are to be of real use every collector should preserve fertile spikes in alcohol (80%) or in formalin (3—4%).

The oldest specimen of any S. African glasswort I have seen is one named "*S. herbacea*" in the Linnaean herbarium, collected at "The Cape" (probably near Cape Town) by Sparmann in the middle of the 18th century. It is barren but is probably *S. Meyeriana* Moss. The earliest published record is by Thunberg (Prod. Pl. Cap. 1. 1794) who briefly described the plant as *S. fruticosa* L. but the only specimen of any S. African glasswort in his herbarium at Uppsala is barren and indeterminable.

KEY TO THE GENERA.

1. Annual: branches all terminating in spikes: flowers protandrous: stigmas tufted .. .. *Salicornia*
1. Perennial: branches not all terminating in spikes: flowers protogynous: stigmas 2- or 3-fid. .. .. *Arthrocnemum*

ARTHROCNEMUM.

Moq. Chen. Mon. Enum. 111. 1840; D.C. Prodr. 13·2. 114. 1849: Ung.- -Sternb. Vers. Syst. Salic. 36. 1866: Atti Congr. Bot. Firen. 1874· 268. 1876: Benth. & Hook. Gen. Pl. 3·1. 65. 1860; Baker & Clarke Fl. Trop. Afr. 6·1. 85. 1909; *emend.*

Shrubs or undershrubs. Shoots erect, decumbent or prostrate, usually much branched, sometimes rooting at the nodes. Some branches barren, others terminating in spikes. Leaves smooth, glabrous, free at the tips. Spikes cylindrical or tapering. Cymules with 3—9 flowers*. Bracteoles wanting. Flowers protogynous, the central bisexual, the lateral bisexual or reduced. Perianth persistent: sepals 3 or commonly 4, almost completely united. Stamens 2, less often 1, appearing in succession. Stigmas 2, less often 3. Seed vertical, elliptical to subspherical: testa smooth or punctulate or hairy: cotyledons green, succulent, conduplicate. Endosperm starchy or wanting.

The type species is *A. fruticosum* (L.) Moq.

About 40 species on sea shores, banks of estuaries and the margins of

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*F. W. Cooke (Trans. N.2. Inst. 44. 349. 1911) describes a plant (named *S. australis*) with cymules with 16 flowers in a double row.

inland salt lakes or in inland saline localities. All in the tropical and warm temperate zones.

The account of the genus given by Baker & Clarke (l.c.) does not apply to all, or even nearly all, the species and the conclusions they draw are of little value. The seeds are, in fact, of considerable help in diagnosing the generic subdivisions.

KEY TO THE SUBGENERA.

1. Flowers almost or quite hidden by the edge of the segment: endosperm present .. .. *Angianthemum*
1. Flowers as long as or longer than the edge of the segment: endosperm usually wanting .. .. *Gymnanthemum*

Sub-gen. 1. **ANGIANTHEMUM** Moss s-gen. nov.

Caules decumbentes vel prostrati. Cymae triflorae, floribus segmento plus minusve omnino obscuratis. Semina laevia vel punctulata non pilosa Endosperma farinosa. Embryo lateralis.

Decumbent or prostrate undershrubs. Cymules with 3 flowers, the flowers hidden or almost hidden by the subtending segment. Seeds smooth or slightly punctulate, not hairy. Endosperm starchy. Embryo lateral. Spicular and spirally thickened cells are absent from both barren and fertile segments.

KEY TO THE SPECIES.

1. Stout: segments of the stem not bordered: spikes cylindrical, obtuse: seed almost smooth .. .. 1. *indica*
1. Segments of the stem bordered: spikes tapering: seeds punctulate
    2. Slender: stem segments cylindrical: seeds elliptical .. .. 2. *africanum*
    2. Stout: stem segments widened upwards: seeds almost spherical .. .. 3. *affine*

1. **A. indicum** (Willd.) Moq. Chen. Mon. Enum. 113. 1840; D.C. Prodr. 13. 2. 151. 1849; Ung.-Sternb. Vers. Syst. Salic. 69. 1866; Atti Congr. Bot. Fir. 1874. 282. 1876; Hook. Fl. Brit. Ind. 5·1. 12. 1890; Cooke Fl. Pres. Bomb. 2. 3. 504. 1906; Baker & Clarke Fl. Trop. Afr. 6·1. 86. 1909 (incl. *A. fruticosum* and *A. macrostachyum*) *S. indica* Willd. Ges. Naturf. Fr. z. Berlin n.s. 2. 111. t. 4. f.2. 1799; Vahl Enum. Pl. 1. 10. 1805; Wight Icon. 3. t.737. 1834—7; *non* R. Br. *nec* Bunge.

A. macrostachyum Hiern. Cat. Pl. Afr. 1·4. 899. 1900 (p. max. pte. ex syn. omn.); *A. pachystachyum* Chev. Rev. Bot. App. 2. 52. 1922. *non* Bunge.

A robust decumbent branching undershrub. Branches glaucous-green to brown, rooting at the lower nodes. Barren segments up to 1·2 cm. long, 0·5—0·8 cm. diam., shorter and wider than those of *A. africanum* or *A. affine*, the free tips spreading in dried material. Spikes cylindrical, obtuse, with 10—16 distinct segments. Cymules 3-flowered, the flowers hidden or almost hidden by the subtending segments. Stamens 2. Stigma

2-fid. Fruiting spike cylindrical, stout, compact, smooth, brown, the old flowers almost or quite hidden: segments wider than the barren, the free tips appressed. Seeds smooth to slightly punctulate, yellow-brown, elliptical, twice as long as wide: embryo slightly curved: endosperm starchy. No spicular or spirally thickened cells in either barren or fertile segments, but numerous sclereids in the inner mesophyll just outside the endodermis and also in the free leaf tips.

The type is *Röttler* in herb. Linn.

The above description is based on my specimens from Lourenço Marques.

Africa. Senegal, (fide *Moq.* l.c.) *Perrotet* (hb. Vienna) Angola. Loanda *Gosweiler* 198; *Welwitsch* 6330, 6331 (type of *A. angolense* Welw. ex Hiern); Mossamedes *Welwitsch* 6329. Port E. Africa, Lourenço Marques *Stocks; Moss & Ottley* 3135, 3140.

Natal, Eshowe *Galpin* (19689 in Nat. Herb.)

Madagascar, *Baron* 6818: *Geay* 6054: *Junelle; Perrier* 8639, 13859; *Pervillé* 661; *Poisson* 347.

Zanzibar, *Boivin* (ann 1841); cf. *Duparquet* 1873; *Marloth* 8970.

Egypt, betn. Kosser & Ras Benas *Schweinfurth* 716.

India. Numerous localities, e.g. *Gamble* 1225; *Röttler* (type).

Ceylon. *Thwaites* 2261.

E. Indies. *Wight* 2476.

Australia. fide *Moq.* l.c.; numerous localities as *A. leiostachyum* Paulsen or *S. leiostachya* Benth.

The records given above, especially those from tropical or subtropical Africa, including Madagascar, are all additions to the previously published range of the species.

The species was originally collected by Röttler on the flats at Tranquebar, India. A specimen is preserved in the Smithiam herbarium of the Linnean Society, London. Paulsen (Dansk. Bot. Ark. 2·8. 62. 1918) reports another in the herbarium at Copenhagen. The species was first reported for Africa by Moquin-Tandon (l.c.). The doubt thrown on this record from Senegal by Chevalier is not justified.

Australian material of *A. leiostachyum* Paulsen (*S. leiostachya* Benth.) as exemplified by Osborn (10647 in herb. Moss) from Adelaide, S. Australia, is identical in all characteristics.

Bentham (l.c.) remarked that *S. indica* Willd. was insufficiently characterised. My own view is that Willdenow's description, illustration, specimens, annotations and locality taken together leave no reasonable doubt as to the identity of the species.

Chevalier (l.c.) erroneously referred the records of *A. indicum* given by Baker & Clarke (l.c.) for East Africa to *S. pachystachya* Bunge; this is discussed under the latter species. A statement by Hutchinson & Dalziel

(Fl. West Trop. Afr. 1·1. 123. 1927) that this species is "common on maritime shores of the northern hemisphere" was obviously made under some misapprehension.

2. **A. africanum** Moss Journ. S. Afr. Bot. 14. 37. 1948. *S. herbacea* auct. (e.g. Harvey Gen. S. Afr. Pl. 285. 1838 (*nomen*) *non* L. *S. natalensis* auct. (e.g. Wright Fl. Cap. 5·1. 450. 1911) *non* Bunge. *S. fruticosa* var. *capensis* Ung.-Sternb. Vers. Syst. Salic. 59. 1866.

A short-lived perennial, scarcely woody. Shoots shining, glaucous, usually gray-green or yellowish when young, fading to brownish-yellow or reddish. Main branches prostrate, the younger ascending. Barren segments up to 3 cm. long and 0·3 cm. wide, fleshy; the older cylindrical, the younger obconical, with a pale or purple rim at the top. Free tips appressed when fresh, spreading when dry. Spikes obconical, up to 6cm. long, with about 30 segments, cylindrical in fruit. Basal segments barren, 5—8 mm. long, the fertile very short, about 2 mm. Lateral spikes shorter. Cymules 3-flowered, the flowers almost or quite hidden, the central flower longer than broad, slightly longer than and completely separating the lateral. Stamens 2: anthers pale yellow. Stigmas 2. Seeds elliptical, twice as long as broad: testa punctulate. Endosperm starchy. No spiral cells occur in the palisade region of either barren or fertile segments. A very few sclereids occur in the inner mesophyll, much fewer than in *A. indicum*.

The type is *Moss* 14243.

Cape. Uitvlugt *Moss* 2691; Rugby *Moss;* Camps Bay *Burchell* 844; Raapenberg *Guthrie* 1313; *Marloth* 8145; *W-Dod* 2398; Black River *Bolus* 3708; Diep River *Pillans* 3230; Sand Vlei *Moss* 3143; *Page*; Muizenberg *Moss* 3590; *W-Dod* 976; Fishhoek *Moss* 3145, 14243 (type); Kommetje *Moss* 3590; *W-Dod* 976.

Caledon. Mossel River *Guthrie.*

Bredasdorp. Struys Bay *Levyns* 3537.

Swellendam. Slang River *Adamson.*

Mossel Bay. Gt. Brak Riv. *Moss* 4342; Little Brak Riv. *Moss* 4343.

George. Wilderness *Stephens.*

Knysna. Knysna *Duthie* 883; *Fourcade* 197, 1997a; *Krauss* 783; Plettenburg Bay *Burchell* 5310.

Bathurst. Port Alfred *Britten* 2118, 5207.

E. London. E. London *Ottley* 2568; Buffalo Riv. *Moss; Rattray* 1274; Nahoon Riv. *Galpin* 5673.

Durban. Durban *Moss* 4337; *Wood* 418.

Port E. Africa. Delagoa Bay *Wager*; Maputuland Ex. H.T.M. 14397.

A. africanum is the commonest of the species near Cape Town and one of the commonest in the Union. On the Cape Flats it is almost an inland species and becomes locally dominant in damp depressions. *A. africanum* hybridises more commonly than any of the other S. African species.

3. **A. affine** Moss sp. nov.

A. africano affinis sed major robustiorque. Caules prostrati, ramis ascendentibus. Segmenta succulentissima, apice latiora, foliis appressis. Spicae obconicae, segmentis fertilibus 10—12, cum segmentis inferioribus sterilibus pluribus. Cymae triflorae, rarissime 4 vel 5-florae, floribus folio obscuratis. Semina ovoidea vel sphaerica, punctulata.

A low undershrub or herbaceous perennial. Shoots very fleshy, glaucous, yellowish or purplish. Primary branches prostrate, the secondary ascending, the fertile prostrate to suberect. Barren segments 3—5 cm. long, 0·8 cm. diam., widened at the top but the older almost cylindrical. Leaf tips appressed when fresh, spreading when dry. Spikes somewhat conical in flower, in fruit 5—9 cm. long. Fertile segments 10—12, about 4 mm. long, several barren segments at the base. Cymules 3-flowered, rarely 4 or 5, the barren spaces between 3—4 mm. wide. Flowers almost or quite hidden. Stamens 2; anthers cream-coloured: pollen spherical, punctulate. Stigmas 2. Seeds broadly oval or spherical, punctulate when ripe. Embryo sharply bent: endosperm starchy.

The type is *Moss* 18122.

Confined to the west coast of southern Africa, from Angola southward to Namaqualand.

Angola. Boca do Giraul *Welwitsch* 6328.

S.W. Africa. Swakopmund *Bradfield* 468; *Compton; Dinter* 262 (Fedde Rep. 343. 1918 as *A. glaucum*); *Galpin & Pearson* 7586; *Moss* 18122 (type); *Rogers*.

Union of S. Afr. Namaqualand *Pillans* 5577; *Moss* 18218, 18219; Van Rynsdorp *Moss* 18117; Clanwilliam *Pole Evans* 27, 28.

A. affine is very closely allied to *A. africanum* but is more robust and stouter in all parts. It may ultimately prove to be no more than a vigorous state of that species, the additional vigour being due to its growing in lower latitudes and consequently a hotter climate. Only experimental cultures can settle the question. The two plants look very different both when growing and also on herbarium sheets.

Sub-gen. 2. **GYMNANTHEMUM** Moss S-gen. nov.

Caules erecti vel decumbentes. Cymae 3—9-florae, floribus apparentibus, segmentorum dimidio aequantibus vel superantibus. Semina pilosa, raro punctulata. Endosperma saepius nulla.

Small shrubs or undershrubs. Cymules with 3—9 flowers, the flowers easily seen at anthesis and reaching at least half way up the segment. Seeds hairy or rarely punctulate. Endosperm wanting or very scanty.

KEY TO THE SECTIONS.

1. Cymules 3-flowered, rarely a few with 4 or 5 . . . . . . 1. *Trianthemum*
1. Cymules all or the lower with 5 or more flowers . . . . 2. *Polyanthemum*

Section 1. **TRIANTHEMUM** Moss sect. nov.

Cymae triflorae.

Cymules with 3 flowers, if rarely some with 4 or 5 most with 3.

KEY TO THE SPECIES.

1. Central flower more than half as long as the segment . .
  2. Groups of flowers laterally contiguous.
    3. Erect: spikes stout, long, cylindrical: central flower distinctly longer than the lateral . . . . . . 4. *littoreum*
    3. Sprawling or prostrate: spikes short, slender: central flower slightly longer than the lateral . . . . 8. *capense*
  2. Groups of flowers laterally separated
    4. Erect, much branched: succulent at tip only: leaf tips spreading: spikes short . . . . 5. *hottentoticum*
    4. Stems stout, succulent all along: leaf tips appressed: spikes long, cylindrical . . . . 12. *pachystachyum*
1. Central flowers not more than half as long as the segment.
  5. Flowers partly hidden . . . . 11. *natalense*
  5. Flowers well exposed.
    6. Stems rooting at the nodes, shining: spikes on main branches only . . . . 6. *perenne*
    6 Stems not rooting, often glaucous: spikes on main and lateral branches.
      7. Segments of older stems moniliform: spikes tapering: central flower slightly longer than the lateral . . . . 9. *dunense*
      7. Segments cylindrical: spikes cylindrical: central flower distinctly longer than the lateral
        8. Glaucous: leaf tips spreading when dry: seeds with conical hairs . . . . . . 7. *Pillansii*
        8. Yellowish: leaf tips appressed: seeds punctulate . . . . 10. *namaquense*

4. **A. littoreum** Moss Journ. S. Afr. Bot. 14. 38. 1948. *S. fruticosa* auct. (Harv. Gen. S. Af. Pl. 285. 1838 (*nomen*); Bolus & Wolley-Dod Trans. S. Af. Phil. Soc. 14. 3ii. 1903 (*nomen*); Wright Fl. Cap. 5·1. 449. 1911 (p. max. pte.)) *non* L. *nec aliorum.*

An erect fastigiate shrub. Stems up to 40 cm. high, 3—4 cm. diam., at the base, not rooting at the nodes. Barren segments thick, very fleshy, subglaucous, usually fading to dull yellowish-brown or rarely to dull red, 1·5—2 cm. long, 0·5 cm. diam. Leaf tips green or red, appressed when fresh, spreading when dry. Spikes thick, cylindrical, terminal on the main branches, 10 cm. long and 0·8 cm. diam., those on short subapical branches smaller. Cymules 3-flowered or rarely a few with 4 or 5 when the outermost are sterile. Flowers contiguous when fresh, separated when dry, the central of the lowest fertile segment extending half way, of the others extending more than half way. Central flower longer than the lateral and completely separating them. Barren spaces between the cymules very small or wanting. Stamens 2: pollen spherical, punctulate. Stigmas 2. Seeds smooth when young, when mature with spreading hairs coiled at the tip. Endosperm wanting. Numerous large spirally thickened cells in both barren and fertile segments. Numerous sclereids in the inner mesophyll of both kinds.

The type is *Moss* 8775.

Namaqualand. Hondeklip Bay *Pillans* (18216, 18217 in herb Bolus)

Cape. Robben Island *Marloth;* Camps Bay *Wolley-Dod* 3056; *Marloth* 8917; *Moss* 3132, 8765, 8775 (type); *Prior; Page;* Hout Bay *Harvey* 194; Kalk Bay *Pillans* 3247.

Caledon. Mossel River *Guthrie* (17210 in herb. Bolus).

Riversdale. Kaffir Kuils River *Muir* 3149; Still Bay *Muir* 5294.

Mossel Bay. Mossel Bay *Burtt-Davy* 15639; *Moss* 4341.

Knysna. Knysna *Adamson* (8763 in herb. Moss); Plettenburg Bay *Smart* (in herb. Rogers).

Port Elizabeth. Cape Recief *Burchell* 4398; Port Elizabeth *Lurie* (18181 in herb. Moss); Walmer *E. M. Young* (17002 in herb. Moss).

The oldest known specimens were collected by Burchell at Cape Recief and by Harvey at Hout Bay. The latter were referred by their collector and also by C. H. Wright to *Salicornia fruticosa* and the plant has usually been so named by subsequent Cape botanists. *A. littoreum* differs from *A. fruticosum* (L.) Moq. in being truly erect, more robust, more fleshy ,in having fastigiate branches, larger more succulent spikes, and hairy mature seeds without endosperm. Anatomically the two species differ considerably.

The habitats and geographical distribution of the two species are totally different. The habitat of *A. littoreum* is unique among glassworts: it does not grow in salt marshes or on saline soil but in rock crevices on the sea coast or occasionally in sand. It extends into the intertidal zone and in such situations is the flowering plant growing nearest to the sea.

5. **A. hottentoticum** Moss sp. nov.

Arbusculus ramosissimus, ramis primariis compressis rigidis erecto-patentibus, ramulis subdivaricatis. Segmenta subcarnosa, viridia vel rubescentia, apicibus liberis atro-rubris etiam in vivo divaricatis. Spicae maturae cylindricae segmentis fertilibus c. 10. Cymae triflorae, flore medio lateralibus longiore. Semina pilosa pilis perbrevibus curvatis. Endosperma nulla.

An erect much branched undershrub up to 70 cm. high, forming circular or elliptical tufts up to 1·3 m. diam. Main branches compressed, erect or suberect, up to 1·5 cm. diam., at the base, brittle almost spinescent, soon losing the leaves. Secondary branches many ascending, the ultimate crowded, wide-spreading. Barren segments dull green to dull red, 0·5—0·6 cm. long, 0·2—0·3 cm. diam., not very fleshy. Free leaf tips often dark crimson, spreading when fresh, widely so when dry. Spikes tapering when young, cylindrical when mature, up to 2 cm. long, 0·3 cm. diam., with about 10 fertile segments. Cymules 3-flowered, appearing in late February, the central flower much longer than the lateral ones: barren spaces between the cymules 1 mm. wide. Pollen spherical, punctulate. Fruit ripe in May. Seeds covered with short curved hairs: endosperm wanting. Spirally thickened cells occur in the palisade of barren segments and many in the fertile. Sclereids occur in the inner mesophyll. Spicular cells are wanting.

The type is *Moss* 8874.

Malmesbury. Malmesbury *Bachmann* 1674.

Cape. Ascot *Levyns* (16968 in herb. Moss); Milnerton *Moss* 3141, 8874 (type); *Pillans* 3223, 3224; *Mund & Maire* 20.

Montagu. Montagu *Michell* (15659 in herb. Bolus); *Rogers* 15498.

Riversdale. Riversdale *Smith* 2770; Doornkraal *Muir* 3079; coast *Marloth* 3587.

This species grows in inland localities at Malmesbury, Montagu and Riversdale. The earliest specimens were collected by Mund & Maire and by Bachmann. Dr. J. Muir states that a vernacular name is "brakbossie" but this probably applies also to other halophytes or semihalophytes.

6. **A. perenne** (Mill.) Moss Journ. S. Afr. Bot. 14. 40. 1948. *S. perennis* Mill. Gard. Dict. ed. 8. 1768.

Var. *radicans* Moss l.c.

S. fruticosa auct. (e.g. L. Fl. Ang. 1754; With. Bot. Arr. ed. 2. 3. 1787; Smith Fl. Brit. 3. 1800) *non* L. Sp. Pl. ed. 2. 5. 1762; *S. radicans* Sm. Eng. Bot. t.1691. 1807; *A. fruticosum* var. *radicans* Moq. Chen. Enum. 112. 1840; DC. Prodr. 13·1. 151. 1849; *S. fruticosa* var. *radicans* Gr. & Godr. Fl. Fr. 3. 28. 1855; *S. fruticosa* var. *paardeneilandica* Ung.-Sternb. Vers Syst. Salic. 59. 1866. (cf. incl. var. *densiflora* Ung.-Sternb. Atti Cong. Bot. Fir. 301. 1876. and var. *densiflora viridis* Ung.-Sternb. l.c. 278. f.20.) *S. sarmentosa* Duval-Jouve Bull. Bot. Soc. Fr. 15. 174. 1868; *S. perennis* var. *radicans* Moss & Salisbury Camb. Brit. Fl. 2. 188. t.195. 1914; *S. arabica* var. *paardeneilandica* Chev. Rev. Bot. App. 2. 33. 58. 1922.

A low undershrub. Shoots shining, dark green fading to brown or yellow, much branched. Barren branches 20—30 cm. long, decumbent, rooting at the nodes: fertile branches ascending or erect. Barren segments about 1 cm. long, 0·4 cm. diam., falling on the older parts. Spikes on the main branches, not on the smaller lateral branches, 2—4 cm. long, with 10—14 fertile segments, rather stout, cylindrical. Lower fertile segments 3—4 mm. long. Cymules 3-flowered, very rarely 4 or 5. Flowers reaching a third in the lowest, three-quarters in the upper segments: central flower wholly separating and slightly longer than the lateral Anthers bilobed, one and a half times as long as wide: pollen spherical, punctulate. Stigmas rarely 3. Seeds covered with spreading conical hairs curved at the tips. Endosperm wanting. Spirally thickened cells occur in the barren segments, a few in the fertile. A few sclereids occur in the endodermis of the barren and in the inner mesophyll of the fertile segments.

Cape. Paarden Island *Drege* 221 (type of *S. fruticosa* v. *paardeneilandica*); Salt River *Moss* 3130, 8757; *Pillans* 3227; Woodstock *Moss* 8756; Noordhoek *Pillans* 3144.

Knysna. Knysna *Adamson* (8875 in herb. Moss); *Duthie* 882; *Moss* 8770 *Fourcade* 1997a.

Port Elizabeth. Port Elizabeth *E. M. Young* (17041 in herb. Moss).

Bathurst. Kowie East *Britten* 5206.

Kentani. Kei River *Flanagan* 1119; *Pegler* 648.

Durban. Durban *Drege* (*S. herbacea* a *procumbens*): *Wood* 418; *Welsh* (17211 in herb. Moss); Umbilo *Moss* 3139, 4335.

Port. East Africa Riv. Suabo *Kirk* 16.

As a plant of western Europe and N.W. Africa *A. perenne* is well known. It was first collected in southern Africa by Drège whose specimens were named without description "*S. herbacea*, ? var. *procumbens*" by E. Meyer. Drège's specimens were collected in winter and those I have seen are barren. However, the characteristic rooting branches leave no doubt as to their identity. In 1866 Ungern-Sternberg (l.c.) published the following inadequate description of it under the name *S. fruticosa* var. *paardeneilandica*. "Stems long, prostrate, rooted, branches erect, for the most part herbaceous, leaf blade very short, rounded, flowers over 2·5 mm. long. Paarden Is. (*S. herbacea* a *procumbens*. *Drege* 221)". I have not seen Drège's plant from the mouth of the Gariep (Orange), the type of *S. fruticosa* var. *densiflora* Ung.-Sternb. (1866) (=*S. fruticosa* var. *densiflora viridis* Ung.-Sternb. (1876)) but from the meagre description, the name, and the figure, it may well be *A. perenne* var. *radicans*. The illustration in Marloth Fl. S. Afr. 1. 184. f.846. 1893 of a plant there named *S. natalensis* from Luderitz is probably *A. perenne* var. *radicans*.

A. africanum x perenne var. radicans Moss hybr. nov.

Habit approaching that of *A. africanum*. Shoot shining, fading to pale yellow. Branches rooting very slightly. Barren segments about 1 cm. long, 0·3—0·4 cm. diam., slightly compressed. Leaf tips appressed when fresh, more or less spreading when dry. Spikes slightly tapering, up to 5 cm. long, with about 22 fertile segments. Cymules 3-flowered, slightly exposed at anthesis: flowers reaching a quarter way up the segment. Seed (immature) smooth. Endosperm wanting.

Cape. Salt River *Moss* 8759.

7. **A. Pillansii** Moss Journ. S. Afr. Bot. 14. 38. 1948.

Undershrub either ascending to 15 cm. high or decumbent with sinuous snake-like much flattened stems 1—2 m. long and 10—15 cm. wide. Branches succulent at the tips only, glaucous. Spikes 4—6 cm. long, 0·3 cm. diam., tapering when young but cylindrical when mature, terminal on each branch, with also several subsessile spikes as side branches near the tips. Fertile segments of the longer spikes 2—2·5 mm. high. Cymules 3-flowered: barren spaces between the cymules as wide as the lateral flowers. Central flowers longer than and wholly separating the lateral, reaching half way up the segment. Pollen oval, slightly rough. Seeds as broad as long, glabrous when young, when mature clothed with stout conical hairs, spreading and not coiled at the tips. Endosperm wanting or very scanty. A few spirally thickened cells occur in both barren and fertile segments and a few sclereids in the inner mesophyll.

The type is *Moss* 8764.

Cape. Salt River *Moss* 3141: Milnerton *Adamson* 917, 2852; *Moss* 8764 (type), 9790; Lakeside *Moss* 18367.

Bredasdorp. Struys Bay *Levyns* 3535.

Mossel Bay. Gt. Brak River *L. Bolus* (18835 in herb. Bolus).

Knysna. Knysna *Duthie* 885, 885a, 885b.

Port Elizabeth. Port Elizabeth *Stephens* (18840 in herb. Moss) Redhouse *Moss* 10016.

Bathurst. Port Alfred *Britten* 1438, 2096; Kowie East *Britten* 5198, 5203.

Two habit forms occur, one, the type, ascending, the other decumbent. Neither in external morphology nor internal anatomy have any differences been noted in the shoots.

8. **A. capense** Moss Journ. S. Afr. Bot. 14. 39. 1948.

A small undershrub, the branches brittle, flowering freely. Barren branches prostrate, not or very slightly rooting at the nodes, with few side branches; fertile branches erect. Segments not very fleshy, thin, 1·4—1·6 cm. long, about 0·2 cm. diam., green or reddish, fading to brown or red. Leaf tips appressed, often remaining so when dry. Spikes cylindrical, obtuse, up to 7 cm. long, 0·3—0·4 cm. diam. Cymules 3-flowered, the barren spaces between very small or absent. Flowers distinctly separated when dry. Central flower reaching a third way up in the lowest segment, but almost to the top in the others. Central flower slightly larger than the lateral. Seeds hairy, the hairs conical, spreading, coiled at the tips. Endosperm wanting. No spirally thickened cells occur in either barren or fertile segments but long spicular cells in the palisade of both. Sclereids are very occasional.

The type is *Moss* 11621.

Cape. Milnerton *Moss* 11621 (type); *Adamson* 847; Riet Vlei *Pillans* 3229 (barren); Uitvlugt *Wolley-Dod* 480; Raapenberg *Wolley-Dod* 2690 (barren), 3590; Noordhoek *Moss* 3133; *Pillans* 3144.

A very local species at present only found in the vicinity of Cape Town where it is rather common on the drier parts of salt marshes and on the edges of shallow lakes or marshes on the Cape Flats. In the latter localities it hybridises with *A. africanum*. Burchell, Harvey and Wallich collected this species but most of their specimens are barren and not determinable with certainty. Wolley-Dod 2690 from near Cape Town is referred by Wright (l.c.) to *S. fruticosa* var. *capensis* Ung.-Sternb., but on what grounds I do not know. The specimen is barren and should probably be referred to *A. capense.*

A. africanum x **capense** Moss hybr. nov.

Habit intermediate between the putative parents. Cymules 3-flowered, the flowers well exposed. Pollen spherical, punctulate. Seeds oval, with stout divaricate hairs curled at the tips. Endosperm wanting. Embryo sharply conduplicate. No spirally thickened or spicular cells in either barren or fertile segments. A few sclereids in the inner mesophyll of both.

Cape. Salt River *Moss* 5259, 8757; Kommetje *Moss* 8883, 11681.

9. **A. dunense** Moss sp. nov.

Arbusculus decumbens ramosissimus. Segmenta glauca moniliformia. Spica apice angustata, segmentis fertilibus c. 20. Cymae triflorae rubro-purpurascentes, flore medio lateralibus longiore, dimidio vel tertio parte segmenti aequante. Semina punctulata, matura pilosa, pilis brevibus obtusis non circinatis.

Small much branched shrublet up to 1 m. high, the older branches decumbent, the younger erect or suberect. Segments 0·5—1 cm. long, 0·3—0·5 cm. diam., pale brown, the older moniliform, constricted at both ends. Spikes 2—4 cm. long, 0·2—0·4 cm. diam., tapering, with about 20 segments. Cymules 3-flowered, the flowers reddish-purple: central flower rather longer than the lateral, reaching a third to half way up the segment. Pollen spherical, punctulate. Stigmas rarely 3. Seeds punctulate when young, when mature with short blunt spreading not-recurved hairs. Endosperm wanting. Large and numerous spirally thickened cells occur in the palisade of both barren and fertile segments and sclereids in the inner mesophyll.

The type is *Moss* 18048.

S.W. Africa. Luderitz *Moss* 18048 (type); *Moss & Ottley* 16629, 11707; *Stöber* (11892 in herb. Marloth).

A. dunense occurs further from the sea than other species associated with it and may act as a dune-former. Flowers are produced chiefly in the summer (Jan.).

10. **A. namaquense** Moss sp. nov.

Arbusculus circa 60 cm. altus, ramis primariis erectis, secondariis suberectis saepe curvatis. Foliorum apices appressi tamen in sicco. Rami alterni tenues pallidi. Spicae terminales lateralesque rubescentes usque ad 4 cm. longae, segmentis fertilibus c. 12. Cymae triflorae, flore medio segmenti dimidio aequante lateralibus longiore. Semina distincte punctulata: endosperma nulla.

Undershrub about 60 cm. high, the main branches erect, the secondary suberect and somewhat curved. Ultimate branchlets short, often widely spreading, pale-coloured, some barren, some fertile. Barren segments up to 1 cm. long 0·2—0·3 cm. diam. The leaf tips not spreading even when dry. Spikes reddish the terminal 4 cm. or more long, 0·2—0·3 cm. diam. at the base, tapering at the tip when in flower but cylindrical in fruit, with about 12 fertile segments: lateral spikes numerous, smaller. Cymules 3-flowered, the central flower reaching half-way up the segment, longer than the lateral. Pollen spherical, punctulate. Seed strongly punctulate. Endosperm wanting. Many long spirally thickened cells in the palisade of both barren and fertile segments. Small sclereids occur in the endodermis. Pith hollow.

The type is *Moss* 17908.

Van Rhynsdorp. Salt River *Moss* 17908 (type).

Namaqualand. Wallekraal *Pillans* (18220 in herb. Bolus). Orange River Mouth *Pillans* 5587.

SPECIES INCOMPLETELY KNOWN.

11. **A. natalense** (Bunge) Moss comb. nov.

S. natalensis Bunge ex Ung.-Sternb. Vers. Syst. Salic. 62. 1866; Atti Congr. Bot. Fir. 1874. 292. f.11. 1876.

Shrubby. Stems creeping and rooting at the base, erect at the tip. Leaves membranous at the tips. Spikes 1·5—2 cm. long, the flowers partly hidden. Cymules 3-flowered, the flowers broad-based, the central scarcely longer than and separating the lateral. Seeds rounded, more or less pointed at the tip, as broad as long.

This species was described from plants collected by Drège near Durban. The specimens I have seen are incomplete and unsatisfactory. The shoot is said to be low, creeping and rooting, which can only apply to *A. perenne* var. *radicans.* However the flowers are stated to show a deceptive similarity to *A. indicum.* The only species known to occur at Durban to which this applies is *A. africanum.* As both these species occur there and no others, I can only suggest that *A. natalense* is a hybrid between them.

Wright (Fl. Cap. 5·1. 450. 1912) regarded *S. natalensis* Bunge as the plant here named *A. africanum* but the non-endospermous seed of the former (cf. Ung.-Sternb. 1876 f.11) precludes the adoption of this view. In his references Ungern-Sternberg mentions a note by Lehmann (Beit. Kent. Fl. Russl. 459. 1851) which judging from the brief description of the seed was not *A. africanum.*

12. **A. pachystachyum** (Bunge) Moss comb. nov. *non* Chev. *S. pachystachya* Bunge ex Ung.-Sternb. Vers. Syst. Salic. 51. 1866 *non* Black.

Perennial. Branches up to 5 cm. long and about 0·5 cm. thick. Middle internodes 0·2 cm. diam. Spikes cylindrical, thick, 4—6 cm. long. Cymules 3-flowered: flowers well exposed, a little broader than long: central flower reaching at least half-way up the segment ($\frac{1}{2}$—$\frac{3}{4}$), the lateral smaller. Seeds long-oval, widest near the rounded posterior end, the anterior tapering to an obtuse tip: testa gray-brown-yellow with a blueish shimmer.

Madagascar. *Boivin* 2370 (type) in Herb. Paris.

Only known from the type specimen. On the same sheet in the Paris herbarium is another specimen. *Pervillé* 661, also from Madagascar which is *A. indicum.* There is no doubt that Chevalier (Rev. Bot. App. 2. 52. 1922) has confused these two and treated them as one species. As the other specimens quoted by Chevalier also belong to *A. indicum* it is evident that the name *A. pachystachyum* Chev. is a synonym of *A. indicum.*

Section 2. **POLYANTHEMUM** Moss sect. nov.

Cymae omnes vel inferiores pluriflorae, 4—9. Semina pilosa. Endosperma nulla.

All or the lower cymules of each spike with more than 3 flowers. Seeds hairy. Endosperm wanting.

KEY TO THE SPECIES.

1. Segments of the spike dumb-bell shaped: cymules at the base 5-flowered, above 3-flowered .. .. 13. *variiflorum*

1. Segments of the spike cylindrical: cymules mostly with 5 or more flowers.

    2. Cymules with 7—9 flowers: flowers almost equal .. 14. *heptiflorum*

    2. Cymules 5-, rarely 7-flowered; the uppermost 5-, 4- or 3-flowered: central flower longer than the lateral .. 15. *australasicum*

13. **A. variiflorum** Moss Journ. S. Afr. Bot. 14. 39. 1948.

Undershrub with procumbent shoots up to 45 cm. long, and smaller suberect branches some of which are fertile. Segments up to 1 cm. long, brown, cork-like. Leaf tips scarcely divaricate even when dry, the youngest spreading. Spikes 3—3·5 cm. long, 3—5 mm. diam., tapering when young but cylindrical when mature, obtuse: fertile segments swollen and dumb-bell-shaped. Cymules with 3—5 flowers, those at the base with 5, the upper with 3. 5-flowered cymules contiguous, 3-flowered separate, the basal fertile segment with one cymule only. Central flower extending at least two-thirds up the segment, only half way in the lowest segment, longer than and completely separating the lateral flowers. Pollen spherical, smooth or slightly rough. Stigmas sometimes 3. Seeds oblong-elliptical, brown, the hairs conical, spreading, coiled at the tip. Embryo relatively large. A very few long narrow spirally thickened and spicular cells occur in the fertile segments. Sclereids occur in the inner mesophyll of the barren segments but not elsewhere.

The type is *Moss* 8765.

Cape. Milnerton *Adamson* 928, 2853; *Levyns*; *Moss* 8765 (type), 8776; Riversdale. Still Bay *Muir* 166.

Knysna. Knysna *Adamson* (9937 in herb. Moss); *Duthie*.

A. variiflorum forms a connecting link between the sections *Polyanthemum* and *Trianthemum* and is the only species of the former to occur on the shores of the Atlantic. The species is easily distinguished from *A. heptiflorum* or *A. australasicum* by the dumb-bell-shaped fertile segments as well as by the variable number of flowers in the cymule.

A. africanum x **variiflorum** Moss hyb. nov.

Intermediate between the putative parents. Pollen grains spherical, slightly rough. Seeds minutely punctulate. No spiral or spicular cells occur, a few sclereids in the inner mesophyll of barren segments and in the inner mesophyll and stele of fertile.

Cape. Milnerton *Moss* (s.n.).

A. perenne var. **radicans** x **variiflorum** Moss hyb. nov.

Intermediate between the putative parents. Pollen grains spherical slightly rough. Seeds hairy, the hairs spreading, coiled at the tips. No

spirally thickened or spicular cells in either barren or fertile segments. A few sclereids occur in the inner mesophyll of both kinds.
Cape. Salt River *Moss* 17211; Knysna *Duthie.*

14. **A. heptiflorum** Moss nom. nov. *S. australis* Sol. ex Forst. Prodr. 88. 1786 (*nomen nudum*); *S. indica* Hook. Handb. N.Z. Fl. 233. 1864. *non.* Willd. *S. pachystachya* Black Fl. S. Austral. 2. 208. f.1. 1924. *non* Bunge ex Ung.-Sternb.

Undershrub. Shoots tall, glaucous, sometimes rooting near the base, the branches erect, suberect or trailing. Older segments brown, corky-looking, up to 2 cm. long and 0·4 cm. diam., the joints not conspicuous, the leaf tips appressed, but the younger segments more obviously jointed and the leaf tips spreading when dry. Spikes stout, cylindrical, 4—7 cm. long, 0·5—0·8 cm. wide when mature, with 15—18 fertile segments, the upper close, the lower well separated. Cymules with 7, sometimes 9 flowers: flowers well exposed, conical, contiguous when fresh, almost equal in height. Barren spaces between the cymules almost wanting. Seeds broadly ovate, slightly longer than broad, hairy, the hairs spreading not coiled at the tip, blunter than those in *A. australasicum.* A few spirally thickened cells occur in the palisade of the fertile segments not elsewhere. A few sclereids occur in the inner mesophyll of both barren and fertile segments.

The type is *Forster* (from N. Z.) in herb. B. M.

Union of S. Africa. Mossel Bay. Gt. Brak River *L. Bolus* (18805 in herb. Bolus); *Moss* 4344. Port Elizabeth. Sydenham *Lurie* (18112 in herb. Moss). Uitenhage. Swartkops Riv. *Zeyher* 5. Bathurst. Port Alfred *Britten* 2078: Kowie East *Britten* 5201, 5205.

Port E. Africa. Lorenço Marques *Moss & Ottley* 16966.

Australia. W. Australia. Perth *Andrews* 706, 707. S. Australia. Glenelg *Black* 8 (type of *S. pachystachya* Black *non.* Bunge. Tasmania. Circular Road *F. v. Mueller.*

New Zealand. N. Island. *Cunningham* 366; Forster (type of *S. australis* Sol.); *Kirk* 12; Auckland *Sinclair* 23.

Australian botanists, apart from Black, have included *A. heptiflorum* in *A. australasicum* (sub. nom. "*S. australis* Sol"). However, *A. heptiflorum* has larger and stouter spikes and its cymules are commonly 7 instead of 5-flowered. The anatomy of the two plants is also different.

The oldest specimen I have seen of *A. heptiflorum* is preserved in the British Museum herbarium and is the type of "*Salicornia australis* Sol. ex Forst." It was collected in New Zealand but no description was published and the name itself appears in a list of "*Plantae dubiae*". There is a vague description of the specimen, in M.S., in the interleaved copy of

Willdenow's Sp. Pl. in the British Museum. It reads:— "australis, Salicornia caule fruticoso decumbente, ramis adscendentibus articulatis, cylindricis, medio subventricosis apice connatis". Forster's specimen should not be confused with R. Brown's 3080 which is discussed under *A. australasicum.* The oldest S. African specimen I have seen is that collected by Zeyher at the mouth of the Swartkops River.

15. **A. australasicum** (Moq.) Moss comb. nov. *Salicornia indica* R. Br. Prodr. 411. 267. 1810. *non.* Willd. *Halocnemum australasicum* Moq. Chen. Mon. Enum. 100. 1840; DC. Prodr. 13·2. 149. 1849; *S. quinqueflora* Bunge ex Ung.-Sternb. Vers. Syst. Salic. 59. 1866; Atti. Congr. Bot. Fir. 1874. 302. 1876; *S. australis* auct. (Benth. Fl. Austral. 5. 205. 1870; Paulsen Dansk. Bot. Ark. 2. 64. 1918; Chev. Rev. Bot. App. 2. 54 & 62. 1922) *non* Sol. ex Forst.

Undershrub. Shoots green, decumbent with erect or suberect branches. Segments brown and cork-like when dry, 2 cm. long, 0·3 cm. diam., the free tips appressed when dry but more or less spreading on young barren branches. Spikes about 3 cm. long, rarely 4 cm., 0·3—0·4 cm. diam., with 10—15 fertile segments, denser than in *A. heptiflorum.* Cymules mostly with 5 flowers, a few with 7, many with 3 or 4. Central flower larger than the lateral, all broad based and separate, the outermost often pistillate or barren. Seeds broadly oval, one and a half times as long as broad, covered with rather long hairs coiled at the tip. A few large spirally thickened cells occur in both barren and fertile segments . No spicular cells occur. Sclereids occur in the inner mesophyll of the fertile segments.

The type is *R. Brown* 3080 in B.M.

Africa. Union S. Af. Mossel Bay. Gt. Brak River *L. Bolus* (18837 in herb. Bolus); Little Brak Riv. *Moss* 4345; Port Elizabeth. Redhouse *Paterson* 497; Uitenhage. Swartkops Riv. *Galpin* 3165; Bathurst Kowie West *Britten* 5207; Kowie East *Britten* 5199, 5208.

Port E. Africa. Lourenço Marques *Moss & Ottley* 11739; *Moss & Rogers* 4339.

E. Indies. *R. Brown* 3080 (type of *S. indica* R. Br. *non* Willd.).

Australia. Many localities, usually as "*S. australis* Sol." e.g. *Andrews* 707; *Tilden* 816.

New Zealand. *Cunningham* 366; *Kirk* 12; *Tilden* 197.

New Caledonia. *Compton* 99.

Hitherto this species has been recorded only from Australasia and the East Indies. Its occurrence in Portugese East Africa and in the Union of S. Africa, now published for the first time, marks an extension of its range. It may in future be found in Natal, Madagascar and some of the islands of the Indian Ocean.

In the past the species has usually been named "*S. australis* Sol." or *S. quinqueflora* Bunge. As already mentioned the name *S. australis* is a *nomen nudum* and its type must be referred to *A. heptiflorum.* The name *S. australis* was first published in 1870, and although the present species comprises the major part of that, the name is antedated by *S. quinqueflora* Bunge (1866) and by *Halocnemum australasicum* Moq. (1840). Bentham & Hooker (Gen. Pl. 3·1. 65. 1860) state that "*Halocnemum australasicum* Moq. est *Salicornia quinqueflora* Bunge".

The oldest and type specimen is *R. Brown* 3080 in herb. B.M. and was named by its collector *S. indica.* There is a M.S. description in the interleaved copy of Willdenow's Sp. Pl. which is repeated in the Prodromus. The reference of the plant to *S. indica* Willd. is an error. The specimen is certainly *Halocnemum australasicum* Moq. R. Brown's specimen was collected during the voyage of H.M.S. Investigator (cf. Journ. Bot. 14. 192. 1876).

SALICORNIA.

L. Sp. Pl. 3. 1753; Gen. Pl. ed. 5. 4. 1754. *emend. S.* sub-gen. *Eusalicornia* Gren. & Godr. FL. Fr. 3. 27. 1855. (*emend*). *S.* sect. *Vulgata* Ung.-Sternb. Vers. Syst. Salic. 43. 1866; *S.* sect. *Annuae* Duval-Jouve Bull. Soc. Bot. Fr. 15. 170. 1866; *S.* sect. *Salicorniella* Moss & Salisbury Camb. Brit. Fl. 2. 187. 1914.

Annuals, erect, decumbent or prostrate, branched, the branches not rooting and all ending in spikes. Leaf tips free. Barren segments often falling away at anthesis and usually before fruiting. Spikes slender, tapering at least when young. Cymules 3-flowered or rarely 1-flowered, the central flower pointed above and narrowed at the base the lateral more or less contiguous. Stamens 1 or 2, if 2 appearing in succession, sometimes wanting in the lateral flowers. Flowers protandrous, the stamens appearing before the stigmas. Stigma tufted, not 2 or 3-fid. Testa thin, smooth, usually covered with slender hairs, appressed and circinate at the tip. Endosperm wanting, starchy perisperm often present. Embryo conduplicate.

The type species is *S. herbacea* L.

KEY TO THE SPECIES.

1. Slender: segments less than 1 cm. long: spikes with about 10 segments: central flower twice as long as the lateral .. 1. *Meyeriana*

1. Stout: segments 2 cm. or more long: spikes with 20—30 segments: central flower not more than one and a half times as long as the lateral .. .. 2. *Perrieri*

1. **S. Meyeriana** Moss Journ. S. Afr. Bot. 14. 36. 1948.

Slender annual with shallow roots. Stems dark green to dark crimson, fading to dull red, erect or decumbent, not over 10 cm. high, much branched. Young branches erect, the latter spreading, the lowest up to 15 cm. long. Segments 1 cm. long or less, 2—3 mm. diam., falling early: leaf tips appressed when fresh. Spikes on both main and lateral branches, 1—2·5 cm. long, tapering when young, cylindrical at the fruiting stage, with about 10 fertile segments. Cymules 3-flowered, the central flower apparent at anthesis, acute, obscurely 4-sided, twice as long as the lateral and almost or quite separating them, in fruit as long as the segment. Barren spaces between the flowers one and a half times as wide as a flower. Seeds elliptical, 1 mm. long, 0·5 mm. wide, covered with long appressed hairs coiled at the tip. Perisperm present but no endosperm. Spirally thickened cells occur in the palisade of both barren and fertile segments. A few small sclereid occur in the endodermis of the barren and in the inner mesophyll of the fertile.

The type is *Levyns* (16969 in herb. Moss).

Cape. Paarden Is. *Drége* 221; *Moss* 3131, 5251, 8760, 8783, 10108, 10109; *Schlechter* 254 (barren); *Levyns* (16969 (type), 18807 in herb. Moss).

Bredasdorp. Struys Bay *Levyns* 3536.

Mossel Bay. Gt. Brak Riv. *L. Bolus* (18807 in herb. Moss); Little Brak Riv. *Moss* 4346.

Knysna. Knysna *Duthie* 884, 884a, 902.

Port Elizabeth. Pt. Elizabeth *E. M. Young* (17001 in herb. Moss).

Bathurst. Kowie *Britten* 2826, 5197.

Natal. Durban. *Moss* 4336, 5252.

Madagascar. *Scott-Elliot* (s.n.).

Without exact locality:— *Sparmann.*

The oldest specimen of *S. Meyeriana* is one on the sheet numbered "2" by the late B. Daydon Jackson in the Linnean herbarium: the specimen was collected by Sparmann and is barren. This is the oldest specimen of any S. African glasswort. The next botanist to collect the plant was Drège who found it at Paarden Island near Cape Town where it is still abundant. Drège's specimens were named *S. herbacea* var. *erecta* by E. Meyer but without description. Ungern-Sternberg included these plants in his *S. herbacea.* Chevalier stated that Drège's annual plant of which the specimens are barren, appeared to constitute a new species but that fresh material was needed before such a species could be founded. The species is named in honour of E. F. W. Meyer who was the first to name S. African glassworts in anything like a critical spirit. *S. Meyeriana* is very tardy in flowering: flower buds may be observed in December but it is 2 or 3 months before they reach antheses. Of the European species it is nearest to *S. ramosissima* Woods.

2. **S, Perrieri** Chev. Rev. Bot. App. 2. 53. 1922.

Stem rather robust, erect or decumbent, up to 40 cm. high. Branches numerous, ascending when young, spreading or decumbent later. Barren segments 1·5—2 cm. long (Chevalier 4—5). Spikes tapering in flower, cylindrical in fruit, 4—8 cm. long, with 20—30 segments. Cymules 3-flowered, the central flower somewhat longer than the lateral and often separating them at maturity, extending four-fifths of the segment. Barren spaces between the cymules about as wide as a flower. Stigmas simple. Seed elliptical or ovate-elliptical, hairy, the hairs mostly appressed, a few spreading, all coiled at the tip. Endosperm wanting: perisperm present. Numerous very long spirally thickened cells occur in the palisade of both barren and fertile segments. Sclereids occur in the inner mesophyll of both kinds.

The type is *Perrier de la Bathie* 1850.

Portugese East Africa. Mozambique *Engler* (cf. Fl. Trop. Afr. 6·1. 87.) *Kirk;* Delagoa Bay *Kuntze* (cf. Rev. Gen. Pl. 3·2. 267). Lorenço Marques *Moss* 6975, 6976, 7073; *Moss & Ottley* 11742, 11743; *Moss & Rogers* 3137; Rikalta *Junod* 20174.

Madagascar. Soalala *Perrier de la Bathie* 1850 (type) Bombaloka *Perrier de la Bathie* 2354.

This species appears to be very closely allied to the south European form of *S. herbacea* L.

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